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URBAN HOME IMPROVEMENT LOAN FLOWS AND THE IMPLICATIONS FOR REDLINING*

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This paper examines two related topics. Initially, the total flow of home improvement loans is examined as a function of a set of socio-economic variables. Second, and of relatively greater concern, the paper tests for the existence of "redlining" in the home improvement loan market. The term "redlining" in this paper refers to the alleged practice of en masse denial of mortgage credit to certain parts of cities where the percent of the population that is black is large, where the racial composition is changing and/or parts of cities composed of predominantly older structures. This working definition encompasses risk consideration as a basis for redlining as well as other factors. The methodological tool used is multiple regression analysis. The units of observation are individual census tracts for the Toledo, Ohio SMSA as delineated in the 1970 Census of Population and Housing.

The paper consists of four sections. First a brief review of literature dealing with discrimination in urban mortgage lending is presented. Next the economic models on which the empirical analysis is based are given. Third, the results of the empirical analysis are presented and discussed. The final section summarizes the findings of the study.

Review of Literature

Possible discrimination in urban mortgage lending practices was evident in the early 1950s although the concept of redlining is of later origin. In an early study dealing with this question, Laurenti [12] found that lenders withheld mortgage credit in racially integrated neighborhoods. The explanation given was that integration lowered property values and that fear existed among lenders that white depositors would withdraw funds from those lending institutions that granted loans to blacks. Other studies by Laurenti [11], McEntire [14] and Hunt [7] found that neighborhoods where integration was occurring at a moderately slow rate did not exhibit substantial decreases in

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property values. This suggests that the lenders' rationale based on perceptions of "prudent lending practices" may be subject to challenge.

Indirect econometric evidence that redlining per se may be taking place on the basis of race arose from the work of Kain and Quigley [9, 10]. These two studies showed that the probability of black families owning their own homes was significantly lower than for white families when socio-economic variables such as income and family size were controlled. Kain and Quigley attributed this result to the existence of discrimination in the housing market but failed to discuss whether such discrimination originated primarily with the mortgage lender, the real estate broker, or the seller.

More recent studies by Kain and Quigley [8], Zelder [19] and McDonald [13] tend to suggest that the discrimination may have its origin on the financial side of the real estate market for single family housing. While these recent studies have not shown the process of discrimination by lenders, they have ruled out certain other causes for Kain and Quigley's results. For example, Zelder introduced a proxy variable to attempt to control for the unobserved wealth holdings of black families. Other studies have adjusted for the smaller proportion of single-unit family dwellings available for owner-occupancy by blacks in the central city. In general the results of these studies conclude that a remaining untested cause such as lender discrimination is the most likely culprit.

An alternative approach to the problem has been to examine the determinants of mortgage loan delinquency rates. von Furstenberg and Green's studies [4, 6] have shown that areas undergoing moderately paced integration experience significantly fewer loan delinquencies and defaults for conventional loans than is the case for all white areas ceteris paribus. However, they found that areas where old residential structures predominated had significantly greater rates of loan delinquency than did newer neighborhoods.

Finally, in a study of minority enterprise loans by Edelstein [3], he found that the factors on which lenders rely most heavily in making loan decisions do not always coincide with those factors which tend to explain loan delinquency. Although the evidence in this study dealt only with minority enterprise loans, it suggests that lenders' credit rationing behavior may not always be justified on the basis of past loan repayment history. This again raises questions about the lenders' behavior reflecting a lack of information or, alternatively, a "taste" for discrimination.

The studies cited above deal primarily with indirect evidence concerning the existence of redlining. Recent studies have provided information of a more direct nature on the question of redlining. In particular, studies under the auspices of the New York State Banking Department found a disproportionately high percent of mortgage loans flowing into areas with low non-white populations in the Brooklyn borough. However, a related study of the Rochester area provided no evidence that institutions discriminated on the basis of race for non-economic reasons [16]. A study of Pittsburgh by Ahlbrandt [1] found that institutions were hesitant to lend in neighborhoods where the percent of non-whites was greater than the city-wide average, but factors other than race were cited as the principle cause of such behavior. In addition, a number of other studies

have recently appeared dealing with this subject [2, 15, 17].

While the literature cited above deals with questions concerning the possibility of racial discrimination and redlining in the home mortgage loan market, none looks directly at the home improvement loan market. This particular market has been essentially ignored in the literature on racial discrimination in the housing market. One reason for this has been the relatively small size of this market compared to the new and used home mortgage loan market. However, there are reasons for arguing that the home improvement loan market is likely to become an increasingly important part of new construction loans in the future. In central city areas, construction of new single-unit family housing is limited by the availability of vacant land and the cost of such land. In addition, the increasing construction and land cost in the new housing market is likely to result in greater upgrading and/or expansion of existing housing. Home improvement loans are also an important consideration in the question of redlining since upgrading the existing housing stock in older and black neighborhoods can be an important deterrent to the decline of such neighborhoods. Finally, there has developed a renewed interest in urban areas for "urban restoration" as opposed to the "federal bulldozer" approach to urban renewal. Where restoration is pursued, home improvement loans flows will be critical for the success of such programs.

The Models

Home Improvement Loan Flows (Model I). This model is a supply-demand model for total owner-occupied home improvement loans by SMSA census tract. In this model, as well as the one to follow, it is assumed that lenders are constrained profit maximizers and households attempt to maximize utility. It is also assumed that neither lenders nor borrowers engage in collusive behavior.

The specification of the model takes the following form with the expected sign of each variable shown above the variable.

$$(1)\quad DLOANS = DLOANS\ (\overset{-}{i},\ \overset{+}{HSTOCK},\ \overset{+}{INCOME},\ \overset{-}{POPGT55},\ \overset{-}{PV},\ \overset{+}{DPV},\ \overset{+}{BLACK},\ \overset{+}{AS},\ \overset{-}{UNEMP})$$

$$(2)\quad SLOANS = SLOANS\ (\overset{+}{i},\ \overset{+}{HSTOCK},\ \overset{+}{INCOME},\ \overset{-+}{BLACK},\ \overset{-+}{DBLACK},\ \overset{+}{DPV},\ \overset{+}{POPGT55},\ \overset{-}{AS})$$

$$(3)\quad DLOANS = SLOANS = LOANS$$

$$(4)\quad LOANS = LOANS\ (\overset{+}{HSTOCK},\ \overset{+}{INCOME},\ \overset{+-}{POPGT55},\ \overset{-+}{BLACK},\ \overset{-+}{DBLACK},\ \overset{-}{PV},\ \overset{+}{DPV},\ \overset{+-}{AS},\ \overset{-}{UNEM}$$

DLOANS = number of home improvement loans demanded by owner-occupants in tract t.

SLOANS = number of home improvement loans supplied to owner-occupants in t.

LOANS = number of home improvement loans transacted in t.

i = effective interest rate on home improvement loans in t.

HSTOCK = number of existing 1-to-4 family housing units (stock) in t.

INCOME = median family income (thousands of dollars) in t.

UNEMP = percent unemployed in t.

POPGT55 = percent of population over 55 years of age in t.

PV = average property value of 1-to-4 family housing units (thousands of dollars) in t.

DPV = change in average property value (from 1960 to 1970) in t.

BLACK = percent of population which is black in t.

DBLACK = change in the percentage of population which is black (from 1960 to 1970) in t.

AS = percent of existing 1-to-4 family housing units that were built before 1940 in t.

t = census tract; t = (1,.....,118).

Equation 1 assumes that the usual price-quantity relationship exists between the price of loans and the quantity demanded. Thus i and DLOANS are assumed to be negatively related. The demand for home improvement loans is assumed to be directly proportional to the size of the existing housing stock. The positive relationship between INCOME and DLOANS reflects the greater ability of higher income families to incur additional debt in the form of a second mortgage or new loan. The greater the proportion of the population over 55 years of age (POPGT55) the smaller the expected demand for home improvement loans. The reason for this expected relationship is that older families are more likely to have acquired homes that meet their needs without having to make substantial home improvements.[1]

In general, it is expected that the greater the present property value of an area the less likely substantial home improvement construction is needed and thus a negative relationship is posited to exist between PV and DLOANS. However, the change in property value is expected to have a positive influence on home improvement loan demand. Areas of increasing property value would lead present owners to feel that any additional investment in their homes could be fully recovered. The proportion of 1-to-4 family housing units built before 1940 (AS) should be positively related to home improvement loan demand since obsolescence due to technological and taste changes increases the need for renovation as structures become older. Since depreciation accelerates as a structure ages, this reinforces the positive relationship between AS and DLOANS. The percent of the population which is black (BLACK) is expected to be positively related to loan demand (DLOANS). This sign reflects a possible desire of black families to live in neighborhoods with other blacks coupled with possible restrictions in their choice of housing location. Since the majority of black neighborhoods is located in nonsuburban areas of the city it is expected that home improvement loans rather than new house construction would be the major source of upgrading housing in such areas. UNEMP is assumed to be inversely related to DLOANS. In areas where high unemployment exists, it is expected that the total demand for home improvement loans will be less, reflecting the inability of unemployed families to incur any type of major debt.

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[1]Life expectancy may also play a role in older families' decisions in relation to incurring additional debt at an advanced age.

On the supply side (Equation 2) the price-quantity relationship is again expected to display the usual positive relationship between i and SLOANS. HSTOCK and SLOANS are expected to vary directly as a result of lender desire to diversify his loan pattern on the basis of census tract size. If a borrower has a higher income, the lender is going to view the borrower as more able to afford a home improvement loan. Therefore, a positive relationship between INCOME and SLOANS is suggested. From the lender's perspective, BLACK and DBLACK are expected to take on a quadratic form. This expectation is predicated on a "tipping point" argument [5, p. 85]. In areas where the percent of the population which is black is within moderate ranges (20-30 percent) the potential for such areas to undergo substantial increases in the black population is considerable. This is particularly true if the predominantly black neighborhoods are unable to provide sufficient housing for a growing black population. The lender's uncertainty about such areas will be affected by his perception of future maintenance and repair expenditures and possible resale value of the property, both of which may be adversely affected by a rapid turnover of property with resulting neighborhood instability. However, once such a "tipping point" is exceeded, uncertainty is reduced and loans become less difficult to secure ceteris paribus. Thus the closer the percent of the black population is to such a tipping point, the less likely home improvement loans are to be made. Beyond some level the loans will start flowing back into these neighborhoods as the neighborhoods become more completely black and racially stable. The same argument applies to the DBLACK variable except here the actual transition is being measured rather than the potential transition. Thus, these two variables have been assigned both a negative and positive sign reflecting the nonlinear quadratic form which falls then rises.

Increasing (decreasing) property values (DPV) will be viewed as a risk reducing (increasing) factor since the value of the collateral backing such loans will be increasing (decreasing). This assumes that there is no immediate reason to believe a reversal in property value is likely, and leads to the positive relationship cited to exist between DPV and SLOANS. AS is expected to decrease loan supply. This is based on the argument that once a home reaches a certain age, lenders may feel that the full recovery of the cost of home improvements is not likely to be covered in the incremental increase in the market value of the home resulting from such improvements. Finally, it is assumed that lenders will view the proportion of the population over 55 years of age as a risk reducing factor. Neighborhoods with older families may be perceived as being more stable and the future income of older applicants is known with greater certainty, i.e., lenders view such income as "permanent income."

Equation 3 simply defines the equilibrium condition in the market. Equation 4 is the reduced form expression for the model and as such will be the equation that is empirically estimated. The signs associated with the reduced form variables follow directly from the previous discussion.

Acceptance Rate (Model II). The previous model was concerned with the total flow of home improvement loans based on both supply and demand considerations. The following model is directly concerned only with lender behavior. As such only the supply considerations will be used as independent

variables in this model.[2] Rather than using the number of loans made as the dependent variable in this model, the percentage of loans accepted is substituted. It is assumed that the interest rate on home improvement loans is at the equilibrium level. This may raise the question that if i is at the equilibrium level, why would anyone who is willing to pay the going price not be able to secure a loan? The problem lies in the nature of financial markets. Since the purchase normally involves delayed payments over a relatively long period of time, the lender views the willingness to pay the going price only as a necessary condition for loan attainment. In addition, the lender will consider other characteristics of the borrower and the borrower's collateral in his decision concerning the granting of a loan.[3]

The desire to isolate the lender's behavior is to observe whether his behavior exhibits any typical redlining characteristics. Of particular concern will be the relationship between the dependent variable and the specific redlining variables included in the model (BLACK, DBLACK, and AS). The model is specified as follows:

$$(5)\quad ACCRATE = ACCRATE(\overset{+}{INCOME},\ \overset{-+}{BLACK},\ \overset{-+}{DBLACK},\ \overset{+}{DPV},\ \overset{-}{AS},\ \overset{+}{POPGT55})$$

where

ACCRATE = percentage of loan applications accepted

The remaining terms retain their previous definitions, and the sign arguments are the same as made for the supply equation in Model I because they are risk variables of concern to lenders' loan approval decisions.

The Empirical Analysis

The Data. There are three major sources of data for this study. First, the number of home improvement loans by census tract was obtained from the four savings and loan associations which dominate the Toledo area mortgage market. In addition two of the four voluntarily provided complete information on the number of rejections by census tracts including the one institution which specializes in home improvement loans. The home improvement loan information was made available pursuant to the mortgage loan disclosure act which became

[2] It should be noted that the equation used in Model II is not strictly a structural equation because of the absence of the interest rate term.

[3] Rather than using other characteristics as a basis for granting or denying a loan, it would be possible for the lender to adjust his price (i) to account for greater or less risk associated with any particular loan. However, lenders tend to use such a method for the allocation of credit within very narrow limits. The reason for this is that lenders feel that such action would be open to public criticism. In addition, usury ceilings in many states make such action impossible.

effective September of 1976. The data cover lending activity for the year 1975. The second source of data is the 1970 Census of Population and Housing, which provided all of the information on the independent variables cited in the model. The third source is the 1960 Census of Population and Housing which provided the data necessary to compute the change in racial composition and the change in property value.

The use of the 1960 data presented certain problems. Some of the census tracts in the 1960 census were changed and reclassified wholely or fractionally in the 1970 census classification. This required an adjustment of the 1960 data to conform to the classifications cited in the 1970 census data. Another problem relates to the fact that the Toledo SMSA was expanded in the 1970 census data. In particular, not all of the outlying suburban census tracts included in the 1970 census were tabulated in the 1960 census tract data. This necessitated the deletion of the new census tracts in the 1970 data since comparable data did not exist in 1960. Finally, the 1970 data are used to approximate the 1975 structure of socio-economic characteristics.

There were 118 census tracts for which both 1960 and 1970 data existed and they comprised the cross-section sample used for this study. The observations were analyzed by means of ordinary least squares regression analysis under the assumption that the equation error terms are normally distributed random variables with zero mean and constant variance.[4] Both the ECON and SPSS computer packages were used in this analysis.

Regression Results. The estimates of Equations 4 and 5 are presented in Table 1. When Equations 4 and 5 were estimated, not all of the variables in the hypothesized models were statistically significant. However, because of a priori arguments which strongly suggested that they belong in the specification of the model, the results presented in Table 1 contain all the initial variables with the exception of the race variables. It was previously argued that both BLACK and DBLACK should be included and that both were expected to take a quadratic form in the supply equation.[5] But when the quadratic forms of both variables were simultaneously included in the same regression equation, none of these variables were statistically significant. This may be a result

[4]Using the Goldfield and Quandt procedure [5] to test for the presence of heteroskedasticity caused by HSTOCK indicated that the hypothesis of homoskedastic error terms can be accepted at the one percent level of significance.

[5]By including BLACK and BLACKSQ in the regression experiment, it is possible to test if the effect of the level of race on LOANS and ACCRATE approximates the quadratic form suggested. This shape will conform to the notion that as BLACK initially increases, LOANS and ACCRATE will decrease. But beyond some point, further increases in BLACK will lead to an increase in LOANS and ACCRATE. To be consistent with earlier arguments, BLACK should have a negative coefficient and BLACKSQ a positive coefficient. The same argument applies to DBLACK and DBLACKSQ.

TABLE 1: Estimates of the Number of Home Improvement Loans Made and the Percentage of Loans Transacted

	MODEL I: LOANS Eq. 4a	Eq. 4b	MODEL II: ACCRATE Eq. 5a	Eq. 5b
CONSTANT	5.3134	2.5684	74.6459	72.2816
BLACK	0.1680+ (2.0675) .5854		-0.5225‡ (2.5568) -.7613	
BLACKSQ	-0.0002 (0.1914) -.0532		0.0059‡ (2.5114) .7235	
DBLACK		0.1336 (1.3097) .2396		-0.0677 (0.2410) -.0503
DBLACKSQ		0.0027 (1.4845) .2641		0.0012 (0.2371) .0488
INCOME	0.0849§ (1.8299) .3994	0.0623 (1.4470) .2932	-0.0010 (0.0165) -.0028	0.0055 (0.0915) .0097
HSTOCK	0.6338‡ (4.6238) .3748	0.7027‡ (5.4508) .4156		
POPGT55	-0.2569* (2.6850) -.2397	-0.1441 (1.5090) -.1344	0.8149+ (3.6475) .3188	0.8347‡ (3.5485) .3267
PV	-4.4003§ (1.8017) -.5313	-4.2061§ (1.8417) -.5081		
DPV	0.3873 (0.1592) .0248	2.2569 (0.9400) .1466	6.7925 (1.5624) .1851	7.8583§ (1.7484) .2142
AS	3.5110 (1.3085) .1571	2.1136 (0.8067) .0944	-25.8277+ (4.4119) -.4866	-27.3881+ (4.5637) -.5161
UNEMP	-0.7177‡ (2.8740) -.2974	-0.1270 (0.5861) -.0524		
$\bar{R}^2$	.4705	.5128	.3742	.3374
S.E.	5.14	4.93	.133	.137
F	12.5436‡	14.6759‡	12.6881‡	10.9624‡

The t values associated with each regression coefficient are shown in parenthesis below the regression coefficients' estimate. The third value given is the beta coefficient.

* denotes significance at the .01 level (two-tailed)

\+ denotes significance at the .05 level (two-tailed)

‡ denotes significance at the .01 level (one-tailed)

§ denotes significance at the .05 level (one-tailed)

of the relatively high degree of collinearity between BLACK and DBLACK (see Table 2). As a consequence (4a) and (5a) in Table 1 contain the results of the estimated equations when only BLACK and BLACKSQ appear as the measure of race, and (4b) and (5b) show the same estimated equations where only the quadratic form of DBLACK is used to measure the effect of race. Finally, because of the sign ambiguity for certain variables (BLACK, POPGT55, AS) in Model I, a two-tailed confidence test was used for these variables. Where supply and demand considerations did not suggest conflicting signs, a one-tailed significance test was used. In Model II all variables are tested using a one-tailed test.

Looking first at Model I, i.e., (4a) and (4b), several points stand out. The level of race (BLACK) in (4a) has a positive sign and is significant at the .05 level while BLACKSQ exhibits a negative sign but is not significantly different from zero. In Equation (4b) neither DBLACK nor DBLACKSQ is significant at the .05 level. This suggests that to the extent that race is an important variable in determining the flow of home improvement loans, the level of race is a better measure than the change in race. One possible explanation for not getting the sign pattern for the quadratic form specified in the supply equation is that the black variable in the demand equation is washing out the supply considerations.[6] This is further confirmed by the fact that AS and POPGT55 both take the sign associated with the demand equation in Model I. The remaining variables have the signs that were expected.

In Model II (5a) and (5b) are formulated primarily to test for indications of redlining behavior on the part of lenders. Thus the variables of major interest are BLACK, DBLACK and AS. An examination of (5a) indicates that the level of race is significant at the .01 level. In addition, the quadratic form of this variable is supported and has the expected sign pattern. The result here also lends further support to the possibility that the demand factor was instrumental in giving the significant positive sign of BLACK in Equation (4a). In Equation (5b), neither DBLACK nor DBLACKSQ is significant although in this case the sign pattern is consistent with what was expected. The significance of the level of race variable in (5a) lends support to the contention that lenders redline on the basis of race. Redlining is further supported when the age of structure variable (AS) is examined.[7] In both

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[6]There was concern that the black variable in the demand equation was serving as a proxy for a central city effect. That is, it was felt that perhaps the reason why black tracts seemed to have a higher demand for home improvement loans was because blacks are concentrated in the central city where there is less vacant land available for expansion of the housing stock. As a consequence, a central city-suburban dummy variable was included in the reduced form equation 4a and 4b. The dummy variable was not significant and did not substantively alter the remaining estimated coefficients or their standard errors.

[7]Different forms of the AS variable were tested including one which measured the average age of structures as a weighted average of the age of the structures in each census tract. None of the alternative forms tested appeared to be superior to the form used in this paper, nor did they substantively alter the empirical results.

TABLE 2: Simple Correlation Matrix of Independent Variables

	BLACK	BLACKSQ	DBLACK	DBLACKSQ	INCOME	HSTOCK	POPGT55	PV	DPV	AS	UNEMP
BLACK											
BLACKSQ	.96										
DBLACK	.60	.47									
DBLACKSQ	.52	.42	.92								
INCOME	-.48	-.43	-.27	-.21							
HSTOCK	-.05	-.02	.01	.01	-.05						
POPGT55	.09	.06	-.01	-.06	-.19	.03					
PV	-.39	-.32	-.24	-.19	-.92	-.17	-.24				
DPV	-.33	-.27	-.28	-.22	.69	-.28	-.45	.83			
AS	.35	.30	.29	.21	-.53	.57	.32	-.61	-.58		
UNEMP	.61	.60	.22	.19	-.63	-.10	.11	-.57	-.42	.40	

Equations (5a) and (5b) this variable is significant at the .01 level and has a negative sign. The remaining control variables, with the exception of INCOME in Equation (5a), have the expected sign.[8]

Summary

This paper presents the results of an examination of the determinants of home improvement loan flows and redlining influences in the Toledo, Ohio SMSA. Based on 1975 home improvement loan data and 1970 census data, multiple regression analysis of the 118 census tracts is performed.

Model I regression results show that variables such as race, median income, size of census tract, average age of residents, unemployment and the level of property values are statistically significant explanatory variables in determining home improvement loan flows. In addition, the results suggest that demand factors tend to predominate the supply considerations where differential influences are expected.

The acceptance rate (Model II) regression results provide support to charges that lenders redline against both racially mixed neighborhoods and neighborhoods dominated by older structures in metropolitan areas. In relation to race, it appears that mortgage credit denial is greatest for census tracts with intermediate concentrations of black as compared to extreme values of this variable. This is suggested by the u-shape taken by the quadratic form of the race variable.

While the study provides evidence that lenders engage in some form of redlining behavior, the basis for such behavior is left unanswered. Arguments based on discrimination as well as on risk aversion may be consistent with the results presented in this paper. However, the results obtained in this study suggest that risk aversion is the more likely explanation based on the quadratic form describing the relationship between the race variable and ACCRATE. In order to better understand the rationale behind such behavior on the lenders' part would require additional information on home improvement loan defaults along with individual home improvement loan application data. Unfortunately, at the present time, neither source of information is readily available.

[8]UNEMP was included in Model II as a possible indicator of lender risk. However, UNEMP was not significant and did not substantively alter any of the conclusions regarding the redlining variables.

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